

Response

Applicant: Dale C. Morris, et al.

Serial No.: 09/499,720

Filed: February 8, 2000

Docket No.: 10991915-1

Title: PRIVILEGE PROMOTION BASED ON CHECK OF PREVIOUS PRIVILEGE LEVEL

IN THE CLAIMS

1. (Original) A method of promoting a current privilege level of a processor of a computer system controlled by an operating system, wherein the current privilege level controls application instruction execution in the computer system by controlling accessibility to system resources, the method comprising:

performing a privilege promotion instruction by the operating system, the privilege promotion instruction being stored in a first page of memory not writeable by application instructions at a first privilege level, the privilege promotion instruction including:

reading a stored previous privilege level state;

comparing the read previous privilege level state to the current privilege level; and

if the previous privilege level state is equal to or less privileged than the current privilege level, promoting the current privilege level to a second privilege level which is higher than the first privilege level.

2. (Original) The method of claim 1 wherein the step of performing the privilege promotion instruction further includes:

if the previous privilege level state is more privileged than the current privilege level, taking an illegal operation fault.

3. (Original) The method of claim 1 wherein the system resources include system registers.

4. (Original) The method of claim 1 wherein the system resources include system instructions.

5. (Original) The method of claim 1 wherein the system resources include memory pages.

6. (Original) A method of executing instructions in a computer system controlled by an operating system, the method comprising:

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executing application instructions in a processor of the computer system at a current privilege level of the processor equal to a first privilege level, wherein the application instructions are stored in a first page of memory, and wherein the current privilege level controls application instruction execution in the computer system by controlling accessibility to system resources;

performing a call instruction to a second page of memory not writeable by the application instructions at the first privilege level, the call instruction including:

storing a return address to the first page of memory; and

storing the first privilege level in a previous privilege level state; and

performing a privilege promotion instruction by the operating system, the privilege promotion instruction being stored in the second page of memory, the privilege promotion instruction including:

reading the stored previous privilege level state;

comparing the read previous privilege level state to the current privilege level;

and

if the previous privilege level state is equal to or less privileged than the current privilege level, promoting the current privilege level to a second privilege level which is higher than the first privilege level.

7. (Original) The method of claim 6 further comprising:

performing a return instruction including:

transferring instruction control flow to the stored return address to the first page of memory; and

demoting the current privilege level to the stored previous privilege level state.

8. (Original) The method of claim 6 wherein the step of performing the privilege promotion instruction further includes:

if the previous privilege level state is more privileged than the current privilege level, taking an illegal operation fault.

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9. (Original) The method of claim 6 wherein the system resources include system registers.
10. (Original) The method of claim 6 wherein the system resources include system instructions.
11. (Original) The method of claim 6 wherein the system resources include memory pages.
12. (Original) A computer system comprising:
- a processor having a current privilege level which controls application instruction execution in the computer system by controlling accessibility to system resources and having a previous privilege level state;
 - a memory having a plurality of memory pages including a first memory page storing a privilege promotion instruction, wherein the first memory page is not writeable by application instructions at a first privilege level; and
 - an operating system stored in the memory for controlling the processor and memory, and performing the privilege promotion instruction as follows:
 - reads the previous privilege level state;
 - compares the read previous privilege level state to the current privilege level;
 - and
 - if the previous privilege level state is equal to or less privileged than the current privilege level, promotes the current privilege level to a second privilege level which is higher than the first privilege level.
13. (Original) The computer system of claim 12 wherein the operating system performing the privilege promotion instruction further includes:
- if the previous privilege level state is more privileged than the current privilege level, taking an illegal operation fault.
14. (Original) The computer system of claim 12 further comprising:

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system registers, and wherein the system resources include the system registers.

15. (Original) The computer system of claim 12 wherein the system resources include system instructions.

16. (Original) The computer system of claim 12 wherein the system resources include memory pages.

17. (Original) A computer system comprising:

- a processor having a current privilege level which controls application instruction execution in the computer system by controlling accessibility to system resources;

- a memory having a plurality of memory pages including a first memory page storing application instructions and a second memory page storing a higher privileged routine and a privilege promotion instruction, wherein the second memory page is not writeable by the application instructions at a first privilege level;

- an operating system stored in the memory for controlling the processor and memory;

- wherein the processor executes the application instructions with the current privilege level equal to the first privilege level and the application instructions perform a call instruction to the second memory page as follows:

- stores a return address to the first memory page; and

- stores the first privilege level in a previous privilege level state; and

- wherein the operating system performs the privilege promotion instruction as follows:

- reads the stored previous privilege level state;

- compares the read previous privilege level state to the current privilege level;

- and

- if the previous privilege level state is equal to or less privileged than the current privilege level, promotes the current privilege level to a second privilege level which is higher than the first privilege level.

18. (Original) The computer system of claim 17 wherein the processor via the higher privileged routine performs a return instruction as follows:

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transfers instruction control flow to the stored return address to the first page of memory; and

demotes the current privilege level to the stored previous privilege level state.

19. (Original) The computer system of claim 17 wherein the operating system performing the privilege promotion instruction further includes:

if the previous privilege level state is more privileged than the current privilege level, taking an illegal operation fault.

20. (Original) The computer system of claim 17 further comprising:

system registers, and wherein the system resources include the system registers.

21. (Original) The computer system of claim 17 wherein the system resources include system instructions.

22. (Original) The computer system of claim 17 wherein the system resources include memory pages.

23. (Original) A computer readable medium containing a privilege promotion instruction for controlling a computer system to perform a method of promoting a current privilege level of a processor of the computer system, wherein the current privilege level controls application instruction execution in the computer system by controlling accessibility to system resources, the method comprising:

reading a stored previous privilege level state;

comparing the read previous privilege level state to the current privilege level; and

if the previous privilege level state is equal to or less privileged than the current privilege level, promoting the current privilege level to a privilege level which is higher than the current privilege level.

24. (Original) The computer readable medium of claim 23 wherein the method of promoting the current privilege level further comprises:

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if the previous privilege level state is more privileged than the current privilege level,
taking an illegal operation fault.